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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/017,013	12/14/2001	Markus Loecher	2000P09074 US01	7807

7590 03/25/2004	EXAMINER
Siemens Corporation	GUTIERREZ, ANTHONY
Intellectual Property Department	

ART UNIT	PAPER NUMBER
2857	

186 Wood Avenue South
Iselin, NJ 08830

DATE MAILED: 03/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *14 December 2001*.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-8* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-8* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☒ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *14 December 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Specification

1.   The disclosure is objected to because of the following informalities:

- It fails to include subject headings including for example "Background of the

    Invention" and "Detailed Description of the Preferred Embodiments".

- There is a spelling error of the word "ESTIIMATION" on page 1, line 11.

Claim Objections

2.   Claims 1-8 are objected to because of the following informalities:

- The phrase "the two independent probabilities" found in claim 1 (page 7, line

    17), in claim 4 (page 9, line 7), claim 7 (page 10, line 12), and claim 8 (page 11,

    line 8), lacks antecedent basis. Appropriate correction is required.

- Claims 2 and 5 include grammatical errors involving the phrases

    "updating...updated" and "constructing...constructed".

- Claim 3 includes the phrase "said classifier corresponding indicating". The

    Examiner believes that it would be grammatically correct to include the phrase

    "said corresponding classifier indicating". This however would lack antecedent

    basis due to the use of the word "corresponding".

- Claims 1, 4, and 6 are missing a closing bracket for the equation involving vector

    f_t.

- Claim 6 contains the phrase "as recited in claim A5", which the Examiner

    believes should say "claim 5".

- Claim 7, line 1 includes the phrase "of a device comprises the steps of modeling". The word "comprises" should be change to "comprising".

Claim Rejections - 35 USC § 102

3.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4.   Claims 1-3, 7 and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Smyth (US Patent 5,465,321).

As to claims 1, 7, and 8, Smyth discloses a method for providing predictive maintenance of a device comprises the steps of modeling as a time series of a discretely sampled signal representative of occurrences of a defined event in the operation of said device (col. 2, lines 58-66), said time series being modeled as two-state (col. 15, line 57) first order Markov processes with associated transition probabilities (col. 9, lines 32-41), wherein one state applies when the number of said occurrences exceeds a certain threshold, and the other state applies when the number of said occurrences falls below said certain threshold (col. 15, line 54-col. 16, line 12); computing transition probabilities for the last N states S_n, where N is a predetermined number (col. 15, line 26-33 and line 66-col. 16, line 15), conducting a supervised training session utilizing a set of J devices, which have failed due to known causes (col. 4, lines 49-61)and considering the two independent probabilities (col. 4,

lines 40-48)and, said training session comprising computing the two-dimensional

feature vectors for the initial M windows of N scans (col. 8, line 51-col. 9, line 1),

computing the two-dimensional feature vectors for the final N number of scans,

plotting a scatter-diagram of all 2D feature vectors, and deriving a pattern classifier by

estimating the optimal linear discriminant which separates the two foregoing sets of

vectors (col. 8, lines 6-50); and applying said classifier to monitor the persistence of

occurrences of said defined event in the operation of said device (col. 19, line 61-67).

As to claim 2, Smyth further discloses updating transition probabilities at each

scan (col. 18, line 62-col. 19, lines 12 and 29-33).

As to claim 3, Smyth further discloses providing a warning of imminent failure of

said device if f falls into a region of a corresponding classifier indicating such failure

prediction (col. 19, lines 42-50).

Claim Rejections - 35 USC § 103

5.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or
> described as set forth in section 102 of this title, if the differences between the subject matter
> sought to be patented and the prior art are such that the subject matter as a whole would
> have been obvious at the time the invention was made to a person having ordinary skill in the
> art to which said subject matter pertains. Patentability shall not be negatived by the manner
> in which the invention was made.

6.   Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Smyth (US Patent 5,465,321) in view of Berezowitz et al. (US Patent 6,453,009).

As to claim 4, Smyth discloses the features of invention as applied to claim 1 above. Smyth does not specifically disclose conducting the supervised training or providing monitoring and predictive maintenance of a device applied specifically to an X-ray tube.

Berezowitz et al., however, discloses a method for predicting X-ray tube life (Title and Abstract). Berezowitz et al. discloses that a variety of medical diagnostic systems are known in which X-ray tubes are employed (col. 1, lines 12-15), and that there is a need for an improved technique for predicting possible failure of X-ray tubes in medical diagnostic equipment (col. 2, lines 17-26). Berezowitz et al. uses a discriminant analysis method that permits effective prediction of possible tube failure by algorithms derived from actual occurrences of historic tube failures (col. 2, lines 43-48, lines 58-61, and col. 10, lines 35-37). Furthermore, Berezowitz teaches that the algorithms may be refined and altered over time and that alternative algorithms may also be developed for particular families or types of tubes, or for particular types of diagnostic equipment (col. 10, lines 38-51).

Smyth discloses that continuous monitoring of complex dynamic systems is an increasingly important issue in medical health monitoring systems, that health monitoring can involve a variety of tasks such as identification of faulty components or prediction of impending failure, and that the specification focuses in the problem of accurately determining the state of a monitored system as a function of time (col. 2, lines 37-66). Further, Smyth teaches learning the symptom-fault mapping directly from training data (col. 5, lines 31 and 32). Finally, Smyth discloses that the method of invention is a parameter estimation technique that generally requires far less precise

knowledge about a system than the state-space approach and therefore tends to be more widely applicable and robust from a practical standpoint (col. 4, lines 18-22 and 61-65).

It therefore would have been obvious to one of ordinary skill in the art at the time of invention to apply the method of Smyth to medical diagnostic system in which X-ray tubes are employed in order to provide its robust, widely applicable benefits to an area in which Berezowitz demonstrates that it is known in the art that there is a need for such an alternative.

As to claim 5, Smyth further discloses updating transition probabilities at each scan and constructing a feature vector (col. 18, line 62-col. 19, lines 12 and 29-33). ·

As to claim 6, Smyth further discloses providing a warning of imminent failure of an X-ray tube if f falls into a region of a corresponding classifier indicating such failure prediction (col. 19, lines 42-50).

Conclusion

7.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- US Patent 6,542,538 to Fischel et al. discloses using a two-state Markov chain to determine whether or not to transmit test data in wireless communication channels.

- US Patent 6,131,089 to Campbell et al. discloses the use of training feature vectors processed by associated classifiers.

- US Patent 5,754,681 to Watanabe et al. discloses information about the prior use of Hidden Markov Models and teaches a method of signal pattern recognition that involve the use of class corresponding discriminant functions and transformed vectors in feature spaces.

- US Patent 5,307,444 to Tsuboka discloses a voice analyzing system that uses Markov modeling of feature vectors.

- US Patent 6,454,460 to Ramanathan et al. discloses a method for calibrating an X-ray system that uses X-ray tube knowledge from a database for calculation corrections.

- US Patent 6,212,256 to Miesbauer et al. disclose a method for replacing X-Ray tubes that operates in a similar scope to US Patent 6,453,009 to Berezowitz et al.

- US Patent 5,396,531 to Hartley uses statistical estimation of Poisson noise for producing X-ray fluoroscopic images.

- US Patent 5,179,582 to Keller et al. discloses a method that replicates an X-ray generator exposure time for subsequent exposures in a series.

- WO20026786 A discloses the use of a Markov chain in a technical system using a probability vector.

- DE 2402230 discloses an advance warning device for X-ray tube failure.

8.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Gutierrez whose telephone number is (571) 272-2215. The Examiner can normally be reached on Monday to Friday.
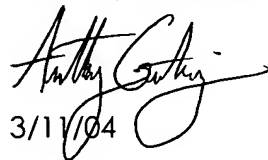
If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Marc Hoff can be reached on (571) 272-2216. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for published

applications may be obtained from either Private PAIR or Public PAIR. Status

information for unpublished applications is available through Private PAIR only. For

more information about the PAIR system, see http://pair-direct.uspto.gov. Should you

have questions on access to the Private PAIR system, contact the Electronic Business

Center (EBC) at 866-217-9197 (toll-free).

Anthony Gutierrez

3/11/04

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